Five-Year Review Report

Second Five-Year Review Report for

South Andover Site
Andover, Anoka County, Minnesota

September 2006

Prepared by:
United States Environmental Protection Agency
Region 5
Chicago, Illinois

Approved by:

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Date:

9-29-06

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List of Acronyms

ARARs	applicable or relevant and appropriate requirements
cPAHs	carcinogenic polynuclear aromatic hydrocarbons
CFR	Code of Federal Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2-DCE	cis-1,2-dichloroethene
CRA	Conestoga-Rovers & Associates
FS	feasibility study
HRL	health risk limit
IC	institutional controls
MCL	maximum contaminant level
MPCA	Minnesota Pollution Control Agency
msl	mean sea level
MW	monitoring well
NCP	National Contingency Plan
NPL	National Priorities List
OU	operable unit
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethene (perchloroethylene)
PRPs	potentially responsible parties
RAL	recommended allowable limit
RA	remedial action
RD	remedial design
RI	remedial investigation
ROD	Record of Decision
SAAG	South Andover Administrative Group
SMCL	secondary maximum contaminant level
SVOC	semi-volatile organic compound
TCE	trichloroethene
TSCA	Toxic Substances Control Act
USEPA	United States Environmental Protection Agency
VIC	Voluntary Investigation and Cleanup
VOC	volatile organic compound

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Executive Summary

The remedy for the South Andover Site included groundwater monitoring [the groundwater operable unit (OU), OU 1] and excavation and off-site treatment and/or disposal of contaminated soils (the soil OU, OU 2). The first five-year review for this site was completed on September 28, 2001. That review found that OU 2 was constructed in accordance with the requirements of the Record of Decision (ROD) and ROD Amendment and was functioning as designed. The review for OU 1, however, found that a protectiveness determination could not be made. It cited recommendations and follow-up actions as follows: (1) performance of additional groundwater sampling; (2) possible installation of additional monitoring wells; and (3) possible indoor air sampling of residences for volatile organic compounds (VOCs).

The trigger for this review was the signing of the first five-year review report in September 2001.

Like the 2001 five-year review report, this five-year review report determined that the OU 1 and OU 2 remedies were constructed in accordance with the RODs and ROD amendments. As in 2001, the most recent sampling data still shows the presence of vinyl chloride in groundwater. While the concentrations have been decreasing over the years, the latest sample, taken in August 2006, shows an increase, now at 41 µg/l, which is above the maximum contaminant level (MCL). This five-year review recommends continued groundwater monitoring. The PRPs have done a residential well survey and found no wells within 1/2 mile of the Site. This five-year review also documents that the PRPs did not perform actual indoor air sampling but did perform an analysis. The PRPs have performed an analysis to estimate the potential concentration of indoor air vapor, based on a "worst case" concentration of vinyl chloride beneath a potential home (170 µg/l). At this concentration, the model predicted a risk at 10^{-7}, which is outside the United States Environmental Protection Agency's (USEPA's) risk range for taking action. With the recent increase in the concentration of vinyl chloride in the groundwater, the possibility of continued plume expansion, and the fact that the science of vapor intrusion is a rapidly developing field, this five-year review recommends further study of vapor intrusion. Finally, neither the 2001 five-year review report nor the remedy resulting from the RODs and the ROD Amendments identified institutional controls (ICs) for this Site. Therefore, this five-year review recommends an IC study which will evaluate the existing controls at the Site. If these are found to be inadequate, recommendations will be made for changes.

The remedy is currently protective of human health and the environment in the short-term for the entire site, because there is no evidence of exposure to site-related contaminants. For the soil OU, the remedy is protective in both the short-term and the long-term. For the groundwater OU, the remedy is protective in the short-term. However, a long-term protectiveness determination for the groundwater OU remedy can not be made at this time; further information is needed. The groundwater monitoring plan is deficient and a possible vapor intrusion pathway must be studied further. Although the Andover City Code restricts the use of groundwater for residential purposes where a public water supply is available, the effectiveness of this restriction is unknown at this time. Further, additional ICs may be needed. The ICs need to be studied to determine their effectiveness and whether any additional ICs are needed, either in the short-term or long-term. An IC plan also must be developed. It is expected that it will take USEPA approximately eighteen months to gather the information described, at which time a protectiveness determination will be made. Therefore, the long-term protectiveness will be deferred for 18 months while additional information is gathered in order to make that determination.

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Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name (from *WasteLAN*): South Andover Site		
EPA ID (from *WasteLAN*): MND980609614		
Region: 5	State: MN	City/County: Andover, Anoka County
SITE STATUS		
NPL status: x Final __ Deleted __ Other (specify) Partially Deleted		
Remediation status (choose all that apply): __ Under construction x Operating __ Complete		
Multiple OUs?* x Yes __ No	Construction completion date: 11/01/94	
Has site been put into reuse? x Yes __ No		
REVIEW STATUS		
Lead Agency: x EPA __ State __ Tribe __ Other Federal Agency _____		
Author name: Bernard J. Schorle		
Author title: Remedial Project Manager	Author affiliation: USEPA, Region 5	
Review period:** 7/06 to 9/06		
Date(s) of site inspection: 9/21/06		
Type of review: x Post-SARA ___ Non-NPL remedial action site ___ Regional discretion	___ Pre-SARA ___ NPL State/Tribe-lead ___ NPL-removal only	
Review number: __ 1 (first) x 2 (second) __ 3 (third) __ Other (specify) _____		
Triggering action: __ Actual RA on-site construction at OU # ___ __ Construction completion __ Other (specify) _____	__ Actual RA start at OU # ___ x Previous five-year review report	
Triggering action date (from *WasteLAN*): 9/28/01	Due date: 9/28/06	

*--"OU" refers to operable unit
**--Review period should correspond to the actual start and end dates of the five-year review in *WasteLAN*

Issues:
1. VOC concentrations in the groundwater remain at levels in excess of MCLs.
2. The vapor intrusion pathway was evaluated by SAAG's contractor in 2002 and needs a re-evaluation.
3. No IC study has been performed.

Recommendations and Follow-up Actions:
1. Develop a groundwater monitoring plan to evaluate the effectiveness of natural attenuation. An estimate of the time that it will take to reach cleanup standards will be made.
2. Re-evaluate the 2002 model results considering recent guidance and science; should this re-evaluation result in the potential for an indoor air problem, develop and perform a vapor intrusion study.
3. Prepare an IC plan and a study.

Protectiveness Statement(s):
The remedy is currently protective of human health and the environment in the short-term for the entire site, because there is no evidence of exposure to site-related contaminants. For the soil OU, the remedy is protective in both the short-term and the long-term. For the groundwater OU, the remedy is protective in the short-term. However, a long-term protectiveness determination for the groundwater OU remedy can not be made at this time; further information is needed. The groundwater monitoring plan is deficient and a possible vapor intrusion pathway must be studied further. Although the Andover City Code restricts the use of groundwater for residential purposes where a public water supply is available, the effectiveness of this restriction is unknown at this time. Further, additional ICs may be needed. The ICs need to be studied to determine their effectiveness and whether any additional ICs are needed, either in the short-term or long-term. An IC plan also must be developed. It is expected that it will take USEPA approximately eighteen months to gather the information described, at which time a protectiveness determination will be made. Therefore, the long-term protectiveness will be deferred for 18 months while additional information is gathered in order to make that determination.

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South Andover Site
Andover, Anoka County, Minnesota
Second Five-Year Review Report

I. Introduction

The purpose of a five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of the review are documented in a five-year review report. In addition, the five-year review report identifies issues found during the review, if any, and provides recommendations to address them.

The U.S. Environmental Protection Agency (USEPA) is preparing this five-year review report pursuant to §121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Part 300).

CERCLA §121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section 104 or 106, the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

USEPA Region 5 has conducted this five-year review of the remedies implemented at the South Andover Site Superfund site (Site) in Andover (Anoka County), Minnesota, a National Priorities List (NPL) site. This review was conducted for the entire Site by the remedial project manager (RPM) for the period from September 2001 through September 2006. This report documents the results of the review.

This is the second five-year review for the Site. The triggering action for this statutory review is the acceptance of the first five-year review report on September 28, 2001. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use or unrestricted exposure.

II. Site Chronology

Event	Date
Salvage operations and waste disposal	1954 - 1981
Two fires involving tires	1988 - 1989
Proposed for placement on the National Priorities List (NPL)	12/30/82
Final on NPL	9/08/83
Remedial investigation (RI) report, operable unit (OU) 1, groundwater	1/29/88
Feasibility study (FS) report, OU 1	1/29/88
Record of Decision, OU 1	3/30/88
RI report, OU 2, soil	July 1991
FS report, OU 2	October 1991
ROD, OU 2	12/24/91
Design investigation report, OU 1	February 1992
ROD Amendment, OU 1	6/09/92
Consent Decree with South Andover Administrative Group (SAAG).	lodged 4/30/93 entered 8/27/93
Focused FS, OU 2	March 1994
ROD Amendment, OU 2	5/31/94
Preliminary Close Out Report (construction completion under CERCLA)	11/1/94
Remedial action report, OU 2	December 1994
Notice of intent to delete OU 2 from the NPL	9/15/98
Notice of deletion of OU 2 from the NPL	10/28/98
First five-year review report	9/28/01
Technical correction of partial deletion of OU 2 from the NPL	8/18/06
Site inspection for second five-year review	9/21/06

III. Background

Physical Characteristics

The South Andover Site (Site) is located in Andover, Minnesota, near its southern limits, approximately 16 miles north-northwest of Minneapolis and 3 miles northeast of the City of Anoka. The site is situated at 45° 16' N Latitude, and 93° 12' W Longitude, in the south half of Section 34, Township 32 North, Range 24 West. The City of Andover was formerly known as Grow Township.

Land and Resource Use

At the time of the remedial investigation, the site was made up of several privately owned parcels of land which totaled approximately 50 acres. Figure 1 shows the site boundaries and the names of some of the operators that were on the Site. Bunker Lake Boulevard defines the northern extent of the irregularly shaped Site and Jay Street is located approximately 500 feet east of the Site. Figure 2 shows the relation of the Site to these two streets and also shows the locations of some of the monitoring wells.

For many years this area was sparsely populated. However, residential development was initiated 1/4 mile north of the Site in the early 1970s, and continued development has occurred to the east, north, and south. Small businesses and new residential developments are now common in

the vicinity of and on the South Andover Site. There are several businesses located on the Site, including Target, a grocery store, and a chain drug store, and a small mall.

The Waste Disposal Engineering Landfill is located 3,000 feet northeast of the Site. This landfill, which formerly accepted hazardous waste, is a National Priorities List site.

There are several small recreational lakes in the area. Crooked Lake is 1 mile west of the Site and Bunker Lake is 1 1/4 mile to the east. The Site is generally located within the Coon Creek watershed, which supports an oak savannah plant community.

History of Contamination

At and prior to the listing of the Site on the National Priorities List, auto salvage operations and the storage, disposal, and incineration of ink, ink and paint sludge, adhesives, chlorinated and nonchlorinated solvents, and other wastes occurred at various locations across the Site. Solvent recovery and the storage of transformers and salvaged electrical equipment have also been reported. Former drum storage and chemical waste disposal areas were partially obscured by more than 3 million waste tires.

Industrial waste handling operations began at the South Andover Site during the mid 1950s. More than 1,000 drums of waste were stored on several contiguous parcels owned by Cecil Heidelberger, William Batson, David and Shirley Heidelberger, Charles Mistelske, and Cyril Link. Trenching, depression filling in wetlands, dumping and burning of wastes, open pit burning, and smelting operations have been reported on several of the parcels.

Two tire fires occurred at the Site. The first occurred during July 1988 near the northeastern portion of the Cecil Heidelberger property. The fire was confined to this general area where small piles of tires and rubber chips were located and was extinguished with water. A second, much larger tire fire occurred at the Site in February 1989. Information from the Minnesota Pollution Control Agency (MPCA) indicates that this fire involved three to five acres and approximately 300,000 tires located near the southeastern portion of the Cecil Heidelberger property. A fire break was established around the fire area and the fire was smothered with sand after burning two to three days. Some empty drums and drums containing industrial chemical wastes were involved in the fire. These drums were later removed from the Site under MPCA's emergency removal program.

Initial Response

Several early investigations were performed at the Site. An initial appraisal was performed by Residual Management Technologies (RMT) and PEDCo Environmental in 1979 at the request of USEPA. A follow-up investigation by RHT/PEDCo in 1981 included the installation of 22 monitoring wells. Ecology & Environment, Inc. (E&E) installed 26 additional wells and 22 piezometers in 1981 as part of an expanded FIT groundwater investigation.

USEPA notified 16 parties in a March 15, 1982 letter that the USEPA was considering spending public funds at the Site and that they may be liable for money expended by the government. These parties included owners, operators and waste generators. In a July 30, 1985 letter USEPA notified 21 PRPs that USEPA planned to conduct a RI and a FS at the Site and that the USEPA would consider an offer by these potentially responsible parties (PRPs) to conduct the RI and FS. None of the PRPs indicated that they had the desire and ability to conduct the RI and FS. Negotiations were terminated in an August 29, 1985 memorandum and Superfund money was used to conduct the investigations and studies.

An initial remedial investigation (RI), completed January 29, 1988, was performed at the Site to characterize the nature and extent of contamination. Soil investigations were limited by the presence of the large volume of tires piled on the Site and piles of junked automobiles at various auto salvage yards onsite so this study dealt mainly with the groundwater, operable unit #1. A feasibility study was performed in conjunction with this RI and the report for the FS was issued January 29, 1988. Following the removal of the tires, a second RI was performed that focused on the potential soil and surface water contamination at the Site, OU 2. The report for this RI was issued in July 1991 and the feasibility study for OU 2 was issued in October 1991. A design investigation took place following the RI for OU 1 to determine current groundwater quality within the surficial aquifer system and to provide the data that would be useful for determining whether the remedy that had been selected for OU 1 should be implemented or revised. The report for the design investigation was issued in February 1992 (incorrectly stated as February 1991 on the title page of the report). When it was discovered through additional sampling that the amount of soil unacceptably contaminated by carcinogenic polynuclear aromatic hydrocarbons (cPAHs) was significantly less than what had been determined previously, a focused feasibility study was conducted to determine the most effective treatment technology for the cPAH soils. The report for this study was issued in March 1994.

The first two remedial investigations showed the presence of three major hydro-stratigraphic units within the unconsolidated sediment: an upper sand aquifer which ranges from 23 to 40 feet thick, an intermediate till and lacustrine aquitard that is 47 to 65 feet thick, and a lower sand aquifer. These unconsolidated sediment deposits are underlain by a sandstone bedrock aquifer. Major water users in the Coon Creek watershed obtain potable water supplies from the bedrock aquifer. The lateral flow in the surficial aquifer was found to radiate in a generally westwardly direction from the eastern portion of the Site. Water level measurements in the well nests indicated a dominant downward component of flow in both the surficial aquifer and the middle aquitard. The potentiometric surface of the lower sand aquifer indicates lateral flow southwest across the Site.

Extent of Contamination

During the initial RI elevated levels of a number of organic and inorganic compounds were detected in shallow monitoring wells on the Site. A summary of the chemicals detected at the Site is given in Table 6-1 of the 1988 RI report. Only one contaminant was detected in the lower sand aquifer, and it was only detected in one well, which contained 97 ppb methylene chloride. The methylene chloride may be a lab contaminant as opposed to actually being present in the well. Residential well sampling by Anoka County and the MPCA indicated that one residential well onsite, which was drawing from the surficial aquifer, was found to be contaminated. This well was ordered to be abandoned by the MPCA.

The contaminants were found in zones of discrete contamination rather than in a continuous plume. This was indicative of the multiple waste handling and disposal operations which occurred on the Site.

The following types of compounds were detected in soil, sediment, surface water, or groundwater at the South Andover Site: halogenated volatile organic compounds (vinyl chloride, methylene chloride, chloroform, 1,1,1-trichoroethane, trichloroethene, tetrachloroethene); nonhalogenated volatile organics (acetone, carbon disulfide, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, toluene, ethyl benzene, styrene, xylenes); halogenated semivolatile organics (PCBs, some pesticides, chlorinated phenols); nonhalogenated semivolatile organics (PAHs, phthalates, phenols); and inorganic compounds (metals, cyanide).

The horizontal extent of contamination was spatially discontinuous and heterogeneous, which is characteristic of a "hot spot" distribution. Vertical contamination was generally limited to surface soils above a depth of 6 feet. Volatile organic compound contamination extended to the water table. Low level volatile organic compound contamination existed in isolated areas onsite in soils and groundwater in both the upper and lower aquifer systems. Semivolatile organic contamination of PAHs occurs in soil. Both soil and groundwater are contaminated with bis(2-ethylhexyl)phthalate. Low concentrations of polychlorinated biphenyls (PCBs) were found in isolated areas in the surface soil. The highest detected PCB concentration was 15 ppm and occurred at the 0 to 6-inch depth interval. Inorganic contamination by antimony and lead was associated with some areas of fill, at depths above 6 feet. Groundwater exhibited elevated levels of arsenic. The observed direction of groundwater flow suggested an onsite arsenic source. It is not known if the arsenic-containing soil onsite is the only source to the groundwater. The semivolatile PAH, PCB, pesticide, and inorganic contaminants present at the Site demonstrate relatively low potential for subsurface mobility. Some volatile organic compounds demonstrated moderate to high mobility.

Basis For Taking Action

The contaminated surficial aquifer exceeded a number of maximum contaminant levels as set by the Safe Drinking Water Act and posed incremental cancer risks of greater than $1x10^{-6}$. The groundwater did not pose an imminent risk to the population because the upper aquifer was not currently being used as a source of drinking water on or near the Site. However, because there was a downward gradient through the aquitard separating the upper and lower sand aquifers, the upper sand aquifer was a possible source of contamination to the lower sand aquifer which served as a regional drinking water source. There was a potential for an increase in the incremental cancer risk of greater than $1x10^{-6}$ if wells were set in the upper aquifer as a result of future development of the Site or if the lower aquifer became contaminated. In addition to the cancer risk, use of the contaminated groundwater would exceed the reference dose for bis(2-ethylhexyl) phthalate and acetone.

In the baseline risk assessment for the Site, the evaluation of metals and detected organic chemicals led to an estimated lifetime cancer risk from groundwater of $5x10^{-4}$ for the upper sand aquifer and $2x10^{-4}$ for the lower sand aquifer. This risk was mainly due to arsenic. Total population cancer risks were dominated by the risk from groundwater. When this risk was added to the risk from soil for residents, the total estimated site-related excess cancer risk ranged from $5x10^{-4}$ to $7x10^{-4}$. The risk of noncancer effects from site-related chemicals was quantified by the ratio of calculated to acceptable intake, termed the hazard index. When the hazard index is less than or equal to 1, no noncancer health effects are considered to be likely. For the groundwater, no contaminant that was detected that contributed a hazard index greater than 1. For pathways other than groundwater in both current and hypothetical future scenarios, the only hazard index greater than 1 was for the hypothetical future child resident at one location, where the subchronic hazard index was 3 due to the presence of antimony. At five surface soil sample locations, lead levels exceeded values that might produce blood levels that exceed 10 to 15 µg/dL, the acceptable level established by USEPA at the time. Lead in groundwater did not exceed the USEPA exposure range.

IV. Remedial Action

Remedy Selected

USEPA issued a Record of Decision for operable unit 1, the groundwater, on March 30, 1988 and then issued a second ROD, for OU 2, the soil, on December 24, 1991. While the soil in-

vestigation was going on there was an additional investigation of the groundwater being done because of questions raised about the remedy that had been selected for the groundwater. The results of this additional investigation lead to USEPA issuing a ROD Amendment for OU 1 on June 9, 1992. In 1993 USEPA negotiated an agreement with some of the potentially responsible parties for the Site, the South Andover Administrative Group (SAAG) to implement the remedy. This resulted in a consent decree that was entered by the court on August 27, 1993. The SAAG retained Conestoga-Rovers & Associates (CRA) as their consultant for the remedial design and remedial action program. In the course of the design work, CRA determined that the quantity of soil contaminated with cPAHs was considerably smaller than had been estimated earlier. USEPA issued a ROD Amendment on May 31, 1994 that changed the means to be used for addressing the soil contaminated with cPAHs.

The major components of the amended groundwater remedy included:

- Short-term monitoring of groundwater at the Site for approximately five years. Ten monitoring wells and one residential well would be sampled semiannually and analyzed for approximately thirty volatile organic and inorganic compounds.
- Immediate resampling of wells if action levels are exceeded. If upon resampling action levels are exceeded, further activities would be initiated.
- Abandonment of those wells no longer being monitored. Wells would be abandoned in accordance with Minnesota Department of Health standards.

The 1988 ROD had three components that were deleted by the 1992 ROD Amendment. These three components are: 1) extraction of groundwater from the surficial aquifer; 2) providing municipal water to private well users on or near the Site; and 3) placing restrictions on new wells on or near the Site.

The major components of the amended soil remedy included:

- Excavate and transport the predominately cPAH-contaminated soils to a facility for thermal treatment in either a rotary kiln incinerator or a low temperature thermal desorption unit.
- Excavate and transport approximately 9,300 cubic yards of soils contaminated with PCBs, cPAHs, lead, and antimony to an offsite solid waste landfill permitted to receive industrial and/or commercial wastes.
- Sample and remove drums previously inventoried by MPCA and USEPA.
- The ROD Amendment served to update the maximum contaminant levels (MCLs) for several constituents which were being monitored in groundwater.
- The ROD Amendment stated that groundwater monitoring would terminate three years after all excavation activities had been completed.

The 1991 ROD had said that the approximately 2,100 cubic yards of predominately cPAH-contaminated soils would be excavated and treated using an above-ground biological treatment unit. The amended soil remedy did not require any institutional controls.

The objectives of the remediation were to remove the unacceptably contaminated soils and to monitor the groundwater until the action levels were reached. The 1991 ROD stated, "The remedial action objective for soil is to clean-up the contaminants of concern to a level which is protective of human health." The action levels for groundwater at the Site are the maximum contaminant levels (MCLs). At the time of the decision documents for the groundwater, the Minnesota Department of Health had health based criteria for contaminants in drinking water referred to as recommended allowable limits (RALs). In the case of public water systems, RALs

were used as guidelines with MCLs being the regulatory standard. Since that time, the RALs have been replaced by health risk limits (HRLs).

Remedy Implementation

As reported in the December 1994 *Remedial Action Report for Operable Unit 2*, the work was conducted between July and October 1994 and involved the excavation and offsite disposal or offsite treatment of contaminated soils. Within each excavation area, samples were collected to delineate and characterize the nature and extent of contamination. Once the excavation was completed, demonstration of cleanup compliance was conducted through the collection and analysis of verification samples. Excavation within one area involved coordination with existing salvage operations that were conducting business on the Site. Within this area, areas of excavation were segregated from the salvage operations in order to isolate contaminated work areas from the salvage operations.

Groundwater and wetland dewatering was required within a couple of other areas in order to lower the water table and facilitate removal of soils. Non-wetland areas were backfilled with imported fill material to pre-existing grades. Excavations within wetland areas were not backfilled in order to increase potential wetland areas. One of the areas was revegetated to restore the existing vegetative cover.

During the remedial program, a total of 38 drums were recovered. These drums were characterized and were incinerated as hazardous waste. In addition, one capacitor was recovered and found to contain PCBs. This capacitor was incinerated as a TSCA waste.

During the excavation of the contaminated areas, tires were encountered. These tires were decontaminated and recycled at a local tire recycling facility. The cPAH-contaminated soils excavated during the remedial program were transported to Soil Remediation Services in Tomah, Wisconsin for thermal treatment. The treated soil was disposed of at the USPCI facility in Rosemount, Minnesota. The total amount of soil sent to Soil Remediation Services and disposed of at USPCI was 88 cubic yards.

The future activities at the Site following the completion of the remedial action were the ongoing monitoring of surface water, sediment from onsite wetlands, and groundwater monitoring for a period of three years.

In November 1993, Phase I of the well abandonment was completed and in September 1994, Phase II was completed. However, several wells in the Phase II program were not abandoned because of the presence of trichloroethene (TCE) and tetrachloroethene (PCE) at well W21B.

The Preliminary Close Out Report was signed November 1, 1994. The report signified construction completion at the Site.

Institutional Controls

ICs are non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and that protect the integrity of the remedy. ICs are required to assure long-term protectiveness for any areas which do not allow for unlimited use or unrestricted exposure (UU/UE).

The groundwater under the Site does not currently allow for UU/UE. The groundwater and soil remedies described in the 1991 ROD and the 1992 and 1994 ROD Amendments did not include

institutional controls. Currently, there are governmental controls in the form of a City ordinance which restricts use of groundwater for residential purposes where a public water supply is available. These institutional controls restrict use of the contaminated groundwater from consumption where public water is available. However, the effectiveness of this IC has not been evaluated. Also, the long term protectiveness of the remedy as a whole may require additional institutional controls such as for groundwater at impacted areas where public water is not available.

An IC study needs to be undertaken, by USEPA , with assistance from the PRPs, to determine the effectiveness of the existing ICs and whether additional ICs, whether interim or long-term, are necessary. Additionally, USEPA will create an IC Plan to determine steps to be taken to assure that any necessary ICs are implemented, maintained, monitored, and enforced. As a part of this process a series of IC maps (paper and GIS versions) will be developed which depict the areas/parcels subject to existing groundwater use restrictions and the areas/parcels which are affected by the groundwater contamination (i.e., the area which does not meet the cleanup levels). These maps will be made available to the public on USEPA's Superfund Data Management System (SDMS) and will serve as an additional IC as an informational control. These maps will be updated as needed.

Monitoring

The first round of post-RA monitoring was initiated in October 1994 and the sixth round was performed in May 1997, which completed the required three years of monitoring.

As reported in the July 1997 *Semiannual Monitoring and Progress Report - Spring 1997*, the last of the regular monitoring reports, the City of Andover had taken, or was in the process of taking, ownership of the Site. The City had begun to clear and grade the Site for development as a commercial/industrial park. The grading affected some of the monitoring wells on the Site and also impacted several of the areas that were part of the remedial activities conducted in 1994. The scrap, rubbish and other waste removals and Site grading were being conducted by the City under the MPCA Voluntary Investigation and Cleanup (VIC) program. A Contingency Plan had been prepared and submitted to the MPCA to address these activities.

In the July 1997 report, the SAAG included the following conclusions concerning the remedial action:

- Impacts to the wetlands had declined to negligible levels and no further remedial actions were believed to be necessary.
- No impacts to the groundwater in the lower aquifer resulting from Site activities had been detected. Further sampling of the lower aquifer was believed to be unnecessary.
- The monitoring of the upper groundwater aquifer indicated that there was no "plume" of contamination at the Site but it did indicate that isolated areas or "hot spots" are found on the Site and that the compounds found in the upper aquifer vary from location to location. At the beginning of the monitoring program, groundwater samples from well W21B contained arsenic, TCE and PCE above the MCLs. The levels of PCE and TCE declined steadily over the monitoring period and were currently at non-detect levels. Arsenic was continuing to be detected at levels just above the MCL and might represent a background condition. Groundwater samples from well W19A had not had detections of any VOC compounds specified in the ROD. However, vinyl chloride was detected at 5.5 µg/l in the spring 1996 round, 59 µg/l in the fall 1996 and 7.8 µg/l in the spring 1997 round. (Vinyl chloride was not one of the VOCs specified in the 1988 ROD and it was not one of the listed constituents to be monitored in the 1992 ROD Amendment. However, it was mentioned as having been detected at up to 12 µg/l in the February 1991 *Final Design*

Investigation Report, which had been used for the 1992 ROD Amendment.) These levels are above the MCL of 2 µg/l. No other VOCs had exceeded an MCL. Groundwater samples from well W23A-R had been at non-detect levels for all VOCs until the spring 1997 round when 1,1,2-TCA was detected at 54 and 37 µg/l in the sample and duplicate sample, respectively. The MCL for this compound is 5 µg/l. PCE was detected in samples from well W1A over the sampling period. The PCE levels had been steadily dropping from its initial level of 6.2 µg/l to non-detect in the final round. The MCL for PCE is 5 µg/l. Samples from well W1B had MCL exceedences for 1,2-DCA, 1,1,2-TCA, and vinyl chloride during the sampling period. 1,2-DCA is a compound cited in the ROD and SOW. It had been detected at levels of 17 to 45 µg/l, which is above its MCL of 5 µg/l. 1,1,2-TCA is not a ROD compound and has only been tested for in the last two rounds of the sampling period. 1,1,2-TCA was found at 18 to 23 µg/l and has an MCL of 5 µg/l. Vinyl chloride was also not specified in the ROD or SOW, but has been tested for by the SAAG. The levels of vinyl chloride have ranged from 215 to 130 µg/l. The vinyl chloride concentrations seemed to be declining, but no trend could be detected for 1,1,2-TCA and 1,2-DCA.

In a September 17, 1997 letter, the SAAG's contractor reported on a natural attenuation study and the results of two rounds of sampling. The sampling program used some of the existing wells and some Geoprobes, temporary 2-inch PVC wells, for collecting groundwater samples. The contractor stated that the groundwater sampling program had identified a chlorinated VOC plume emanating from the Site towards the west-southwest. Vinyl chloride was the primary VOC within this plume along with other parent VOCs, such as TCE. Analytical results collected from seven temporary well locations and three monitoring wells (W1A, W1B, and W23A-R) had provided evidence that intrinsic bioremediation of the chlorinated VOCs was occurring within the upper sand aquifer. The groundwater samples showed that the plume was restricted primarily to the lower zone of the upper sand aquifer, between 25 feet and 50 feet bis, and had a narrow width (less than 300 feet). The plume length had not been completely defined, but it was likely that it extended up to 800 feet beyond well W1B. In round 1 (July 30-31, 1997), the vinyl chloride concentration in well W1B was 140 µg/l and in Geoprobes GPD., which was about 170 ft west of well W1B, it was 120 µg/l. In round 2 (August 19-21, 1997), the vinyl chloride concentration in well W1B was 130 µg/l, in Geoprobes GPD. it was 200 µg/l, and in Geoprobes GP-6, which was near the Thrush St. NW cull-de-sac, about 400 ft west-southwest of well W1B, it was 75 µg/l.

Some modeling was done and the results suggested that the vinyl chloride plume would not extend beyond 1,000 feet from the Site. A well survey was conducted within a one-half mile radius (2,600 feet) of the W1 well nest that was focused on the area that is hydraulically downgradient (west and south) of well W1B. The well survey did not identify any residential wells within this radius to the south or west, nor was Coon Creek within the one-half mile radius. Thus it was concluded that the attenuation of the vinyl chloride plume within 1,000 feet of the site did not appear to pose an immediate threat to potential human or ecological receptors.

In an August 21, 1998 letter, the SAAG's contractor reported on round 3 (May 11-19, 1998) of the sampling for the natural attenuation study. In this round, in Geoprobe GP-15, which was located near Thrush St. NW, about 550 ft southwest of well W1B, the vinyl chloride concentration was 170 µg/l. In the Summary, the contractor stated, "The groundwater chemistry downgradient from the Site documents natural attenuation of vinyl chloride within the Upper Sand Aquifer, a non-potable aquifer. Analytical data and transport modeling show that the vinyl chloride plume is of limited extent and is attenuated within approximately 1,300 feet from the Site." The contractor recommended some semi-annual monitoring for three years to check that the chlorinated VOC plume continued to attenuate. A monitoring program was not set up due to

the inability to obtain access from the City of Andover.

It is to be noted that the Andover City Code states that public water is required in all new developments located in areas where public water is available (Section 12-4-1) (last amended on October 21, 1970). Section 10-1-18 of the Andover City Code covers private wells. Some of the provisions of this section are: 1) Except where municipal water is not available, it shall be unlawful to construct, reconstruct, or repair any private water system which is designed or intended to provide water for human consumption. Private wells, to provide water for other than human consumption, may be constructed/maintained and continued in use after connection is made to the water system, provided there is no means of cross connection between the private well and municipal water supply at any time. 2) All new homes or buildings (as of May 5, 1981) shall connect to the municipal water system if water is available to the property. 3) At such time as municipal water becomes available to existing homes or buildings, a direct connection shall be made to such public system within a period of time as determined by the City Council. 4) Unused wells must be sealed and abandoned.

In the September 15, 1998 *Federal Register*, the USEPA published a notice of intent to delete OU 2 of the Site from the National Priorities List and requested comments on this. The partial delisting was being taken by USEPA because it had been determined that the responsible parties had implemented all response actions required and USEPA, in consultation with the State of Minnesota, had determined that no further response was appropriate for this particular operable unit. The USEPA and the State had determined that remedial activities conducted at the Site to date had been protective of public health, welfare, and the environment. In the October 28, 1998 *Federal Register*, USEPA announced the deletion of OU 2 of the Site from the NPL; no comments had been received. This did not delete OU 1. In the August 18, 2006 *Federal Register*, USEPA published a technical correction concerning the partial delisting.

On April 25, 2000, MPCA certified that response actions had been completed as set forth in the approved voluntary response action plan for the site that had been submitted by the City of Andover. According to the Site Summary that was included with the Certificate, the response actions that the City completed covered an area larger than that of the Superfund site; this site contains about 90 acres and is roughly a rectangular property that originally included 24 separate parcels. This South Andover Redevelopment Site is bounded on the north by Bunker Lake Boulevard, on the west by Thrush Street Northwest, on the southwest by developed residential properties, on the southeast by Commercial Boulevard Northwest, and on the east by Jay Street. The City's initial plan was designed as a Site Contingency Plan whose purpose was to specify how potentially hazardous materials were to be screened, characterized, and remediated as the City graded and prepared the site for redevelopment. The Site Contingency Plan, parcel-specific investigations, and interim response action proposals were implemented by the City to identify and remediate additional areas of soil contamination not previously addressed during the Superfund site investigation. The Site Summary includes a table that summarizes the response actions performed on the various parcels.

V. Progress Since the Last Five-Year Review

In 2000 and in 2002 the Andover Economic Development Authority notified USEPA that the titles for some of the properties that were part of the Site were being transferred to other parties.

In a letter dated February 21, 2001, the SAAG's contractor reported the results on a November 2000 sample from well W1B: the vinyl chloride concentration was 0.79J µg/l whereas in 1997 it was 140 µg/l in July and 130 µg/l in August. In a January 23, 2002 letter, SAAG's contractor reported the results of the analysis of a sample that had been taken from well W1B on September

20, 2001. The vinyl chloride concentration in this well was 3.8 µg/l. The sample also contained 3.9 µg/l of TCE and 0.38J µg/l of PCE.

In the January 2002 letter, SAAG's contractor also reported the results of calculations that were done to determine if there might be a potential indoor air problem from vapor intrusion due to the vinyl chloride concentrations in the groundwater. This concern had been raised during the last five-year review. The model used resulted in a calculated indoor air concentration of 0.109 $\mu g/m^3$ when a groundwater concentration of 170 µg/l was used. The depth to groundwater used was 19 feet below the ground surface and the residence had a basement that extended 6 feet below the ground surface. This calculated value is four orders of magnitude below the American Conference of Government Industrial Hygienists threshold limit value of 2560 $\mu g/m^3$, which is for an adult worker environment. A risk assessment was also conducted for a residential scenario. The non-cancer hazard index for a reasonable maximum inhalation exposure for a child was 0.002, well below the USEPA accepted value of 1.0. For a total lifetime carcinogenic exposure, the calculated risk was 3.8×10^{-7}, which is less than the USEPA risk range of 10^{-4} to 10^{-6}.

In a memorandum from the Commissioner of MPCA dated November 21, 2003, the South Andover site was deleted from the Minnesota Permanent List of Priorities. Nile Fellows of the MPCA's Remediation Division, Superfund & Emergency Response Section, commented in a April 15, 2003 memorandum regarding the delisting that the implemented remedies at the Site are protective of human health and the environment.

In a September 11, 2006 letter, the SAAG's contractor reported on the results of the analysis of a sample taken from well W1B on August 6, 2006. The sample contained four VOCs: 1,1-dichloroethane at 8.7 µg/l; 1,2-dichloroethane at 5.6 µg/l; trichloroethene at 6.8 µg/l; and vinyl chloride at 41 µg/l. Although this vinyl chloride concentration is an increase over the concentrations in 2000 and 2001, it is significantly below the concentrations that were seen in the 1995 to 1997 period when the concentrations ranged from over 200 µg/l down to around 150 µg/l.

These are the issues raised in the previous five-year review and their status.

Issue	Recommendation	Status
Additional groundwater sampling needed for defining the extent of the plume and for evaluating natural attenuation	PRPs need to develop monitoring plan(s)	USEPA gave conditional approval to SAAG's September 2003 revised work plan in March 2004. SAAG agreed in April 2004 to perform work if USEPA accepted a slight modification of the contingencies. There was no follow-up. SAAG's contractor evaluated natural attenuation prior to the last five-year review and found natural attenuation feasible. No monitoring plan set up.
Determining if vapor intrusion into residential homes above the VC plume might be a concern	Evaluate this possibility.	SAAG's contractor evaluated the vapor intrusion concern using a model that has been commonly used for this. Their results, reported in January 2002, indicated that there was no concern. See above.

Issue	Recommendation	Status
SAAG has not reached an agreement with City of Andover concerning possible locations for additional wells.	USEPA offered to work with the parties.	SAAG has not been able to get permission from the City of Andover to install monitoring wells in the roadway. Such wells require special construction that results in about a 2-inch bump in the roadway, and the City is concerned about having to plow snow from these. If wells are placed in a residence's yard, the state requires a stickup. SAAG does not believe such wells should be located at residences.

VI. Five-Year Review Process

Administrative Components

USEPA initiated the second five-year review for the Site in July 2006. At that time USEPA informed the state's project manager and the SAAG's contractor that the five-year review was to be done.

The review consisted of: document review; data review; community notification; Site inspection; and report development and review.

Community Notification and Involvement

About September 8, 2006, USEPA sent a notice to approximately 200 parties who might have an interest in the Site. These parties consisted of City of Andover personnel, commercial establishments that are located on or near the Site, and nearby residents. The notice stated that comments could be submitted through September 19, 2006. The notice also provided information on the review and the remedy for the Site. No comments were received by USEPA concerning the review.

USEPA will inform the public of the completion of the review and the availability of the report once the report is signed.

Document Review

The review is based upon the Site visit, discussions with the state project manager and the CRA representative, reports on the various investigations and analyses, the decision documents, and the reports on the results of the monitoring that has been performed since remedy construction was completed. Attachment A contains a list of the documents that were used for the review.

Data Review

USEPA reviewed the data from the monitoring that has been performed since the completion of the construction of the original remedies. Also reviewed were the letter reports for the natural attenuation study, the letter reports providing the results of more recent limited monitoring, and the analyses of the possibility of a vapor intrusion problem. These reports are listed in Attachment A.

Site Inspection

The USEPA RPM and the MPCA project manager visited the site on September 21, 2006. The CRA representative who has been working on the Site for a number of years on behalf of the PRPs was also present.

A large portion of the Site has been commercially developed. Buildings and parking lots cover much of the ground. There is still some grass area in the middle of the Site that includes a pond; this was originally a wetland area. South of the Site is a residential area. It is also residential at the Thrush St. NW cul-de-sac. Well nest W1 and well nest W23 were inspected. Well nest W21 could not be located because of the dense vegetation.

VII. Technical Assessment

Question A. Is the remedy functioning as intended by the decision documents?

Yes.

The land surface, OU 2, has been cleaned up and this part has been deleted from the NPL. The groundwater was monitored for the length of time that had been specified in the decision documents.

However, groundwater monitoring needs to continue to determine if attenuation of the contaminants will continue, and this is not presently being done on a regular basis. Groundwater (OU 1) contaminant concentrations remain at levels in excess of MCLs. The amended groundwater and soil remedies described in the 1992 and 1994 ROD Amendments did not include institutional controls. Governmental controls are in effect which impose use restrictions for groundwater. However, since an IC study was not done, the effectiveness of the governmental controls and the monitoring or enforcement of such controls is unclear. Such controls are intended to be protective against consumption of potentially contaminated groundwater where public water is available. The long term protectiveness of the remedy as a whole may require additional institutional controls for groundwater at impacted areas where public water is not available. The potential residential indoor air problem due to vinyl chloride concentrations in the groundwater needs to be studied further.

An IC plan will be developed within six months to determine if any additional ICs are needed. The plan will be developed by USEPA. In conjunction with the IC plan there will be an IC study performed by the PRPs with oversight by USEPA. This study will include a determination of whether deeds to any site parcels contain groundwater use restrictions, a review of the effectiveness of the existing ICs, and a review of whether any ICs are necessary to address indoor air problems, among other things.

During the next six months, USEPA will review what has been done regarding the possible indoor air problem and then determine what else needs to be done, if anything.

During the next six months, USEPA will work with the PRPs to develop a groundwater monitoring program.

Question B. Are the exposure assumptions, toxicity data, clean-up levels, and remedial action objectives used at the time of the remedy selection still valid?

No.

At the time of the decision documents for this Site, there was no consideration given to a possible indoor air problem. This needs further study, and if a problem is found it will be necessary to establish a remedial action objective. In addition, the vinyl chloride in the groundwater remain high and this will need to be studied.

The exposure assumptions, clean-up levels, and remedial action objectives concerning the problems that were addressed in the decision documents, have remained the same for both OUs, except for the change in the MCL for arsenic (50 µg/l to 10 µg/l). The old MCL has been exceeded in the past. This will require further evaluation.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?

No.

However, as in 2001, the potential for a vapor intrusion problem needs to be addressed. While governmental controls are in place to prevent consumption of groundwater, the fact that no institutional controls were required in the previous decision documents needs to be examined to determine if further institutional controls are needed.

Technical Assessment Summary

Based on this review, the remedy has functioned in the manner intended. However, the vinyl chloride concentrations have probably remained higher than was thought would be the case when the remedies were selected. During the next six months, an IC plan will be developed, a groundwater plan will be developed, and a study will be made of what has been done regarding a possible indoor air problem (vapor intrusion) to determine if anything further actions need to be taken.

VIII. Issues

1. VOC concentrations in the groundwater remain at levels in excess of MCLs.
2. The vapor intrusion pathway was evaluated by SAAG's contractor in 2002 and needs a re-evaluation.
3. No IC study has been performed.

IX. Recommendations and Follow-Up Actions

1. Develop a groundwater monitoring plan to evaluate the effectiveness of natural attenuation. An estimate of the time that it will take to reach cleanup standards will be made.
2. Re-evaluate the 2002 model results considering recent guidance and science; should this re-evaluation result in the potential for an indoor air problem, develop and perform a vapor intrusion study.
3. Prepare an IC plan and a study.

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Mile-stone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Groundwater contamination remains	Develop a ground-water monitoring plan to be able to evaluate whether natural attenuation is occurring.	PRPs	USEPA	March 2007	N	Y
Potential for an indoor air problem	Evaluate the studies the PRPs have done to determine if any further work is needed.	USEPA	NA	March 2007	N	Y
ICs	Complete IC study and develop a plan	PRPs/USEPA	USEPA	March 2007	N	Y

X. Protectiveness Statement

The remedy is currently protective of human health and the environment in the short-term for the entire site, because there is no evidence of exposure to site-related contaminants. For the soil OU, the remedy is protective in both the short-term and the long-term. For the groundwater OU, the remedy is protective in the short-term. However, a long-term protectiveness determination for the groundwater OU remedy can not be made at this time; further information is needed. The groundwater monitoring plan is deficient and a possible vapor intrusion pathway must be studied further. Although the Andover City Code restricts the use of groundwater for residential purposes where a public water supply is available, the effectiveness of this restriction is unknown at this time. Further, additional ICs may be needed. The ICs need to be studied to determine their effectiveness and whether any additional ICs are needed, either in the short-term or long-term. An IC plan also must be developed. It is expected that it will take USEPA approximately eighteen months to gather the information described, at which time a protectiveness determination will be made. Therefore, the long-term protectiveness will be deferred for 18 months while additional information is gathered in order to make that determination.

XI. Next Review

The next five-year review for the South Andover Site is required in September 2011, five years from the date of this review.

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Attachment A

Documents Consulted

Andover City Code

Final Remedial Investigation Report, CH2M Hill, January 29, 1988

Public Comment Feasibility Study Report, CH2M Hill, January 29, 1988

Record of Decision--Initial Groundwater Operable Unit, USEPA, March 30, 1988

Final Design Investigation Report, South Andover, First Operable Unit, Donohue & Associates, Inc., February 1991

Final Remedial Investigation Report, South Andover, Second Operable Unit Donohue & Associates, Inc., July 1991

Final Feasibility Study Report for South Andover Superfund Site Second Operable Unit, Donohue & Associates, Inc., December 1991

Record of Decision (soil operable unit remedial action), USEPA, December 24, 1991

Record of Decision Amendment (groundwater remedial action), USEPA, June 9, 1992

Consent Decree, United States and South Andover Administrative Group, entered August 27, 1993

Record of Decision Amendment (soil remedial action), USEPA, May 31, 1994

Remedial Action Report for Operable Unit 2 (Soil Remediation), Conestoga-Rovers & Associates, December 1994

Focused Feasibility Study (South Andover Superfund Site), Conestoga-Rovers & Associates, March 1994

Preliminary Site Close Out Report, USEPA, November 1, 1994

Semiannual Monitoring and Progress Report - Spring 1997, Conestoga-Rovers & Associates, July 1997

Letter Report: "Natural Attenuation Study, South Andover Superfund Site", Conestoga-Rovers & Associates, September 17, 1997

Letter: "Abandonment of Monitoring Wells; South Andover Superfund Site; Andover, MN", USEPA, February 13, 1998

Letter Report: "Natural Attenuation Study - Round 3, South Andover Superfund Site", Conestoga-Rovers & Associates, August 21, 1998

"Notice of intent to delete Operable Unit 2 of the South Andover Salvage Yards site from the National Priorities List; request for comments.", USEPA, *Federal Register*, September

15. 1998

"Final rule; notice of deletion of the Operable Unit 2 of the South Andover Salvage Yards Superfund site from the National Priorities List (NPL).", *Federal Register*, October 28, 1998

"Commissioner's Certificate of Completion of Response Actions Under the Land Recycling Act of 1992, As Amended". MPCA. April 25. 2000

First Five-Year Review Report For South Andover Salvage Yard, USEPA, September 28, 2001

Letter Report: "Recent Groundwater Sampling Results from Monitoring Well W1B, Vapor Migration Model Evaluation and Associated Risk Assessment, and a Proposed Off-Site Groundwater Sampling Program", Conestoga-Rovers & Associates, January 23, 2002

Memorandum: "Approval of the November 2003 Update of the Minnesota Environmental Response and Liability Act Permanent List of Priorities", MPCA, November 21, 2003

Letter: Contingent approval of CRA's revised work plan. USEPA, March 12, 2004

Letter: "Geoprobe Investigation, South Andover Superfund Site", CRA, April 16, 2004

South Andover (MND980609614) Statistical Analysis Report--Sampling Period: 12/1979 to 05/1998, Volpe National Transportation Systems Center, U.S. Department of Transportation, June 2004

"Technical Correction of final partial deletion of the South Andover Salvage Yards Superfund Site from the National Priorities List.", *Federal Register*, August 18, 2006

Letter Report: "W1B Sample Results, South Andover Superfund Site", Conestoga-Rovers & Associates, September 11. 2006

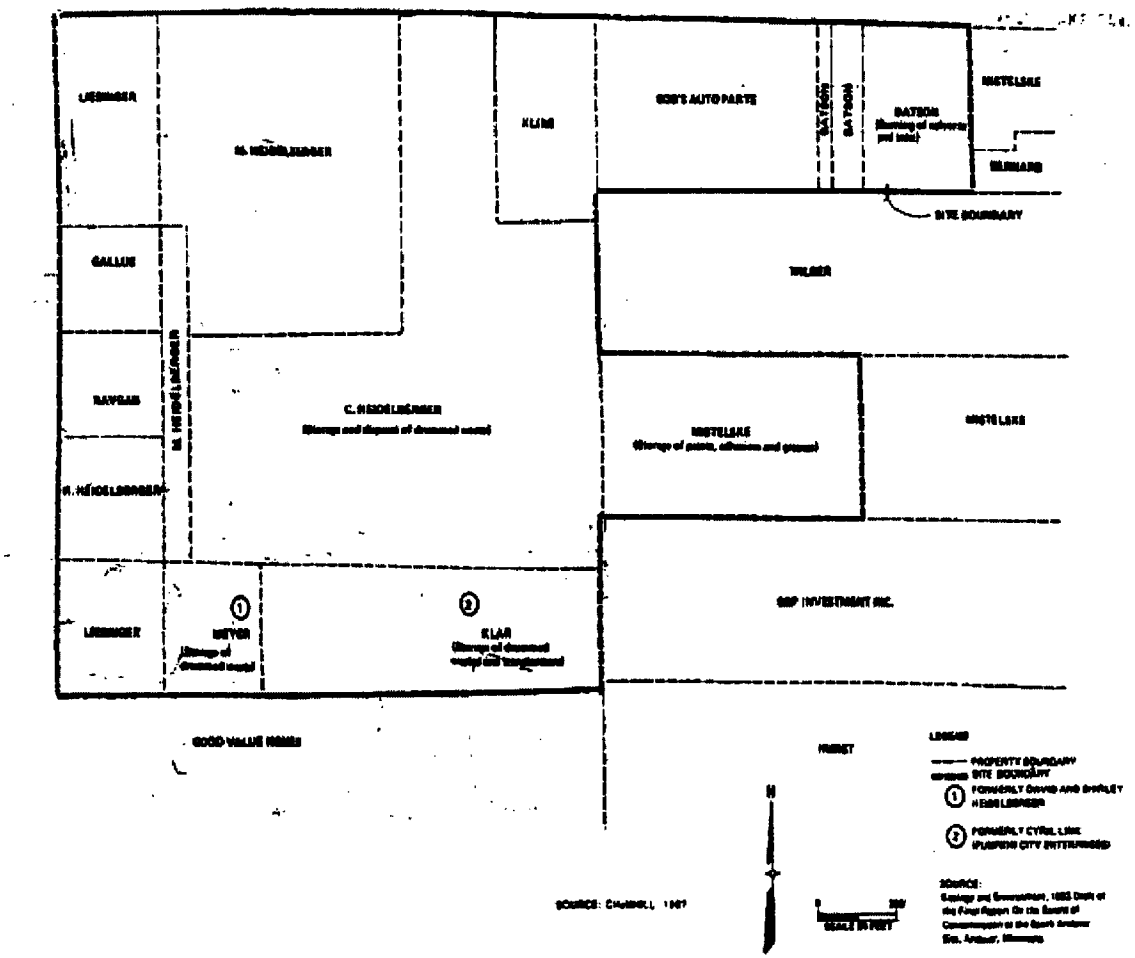

Figure 1. Site boundaries and reported waste disposal activities, South Andover Site.
(from *Final Design Investigation Report*, Donohue, Inc., February 1991)

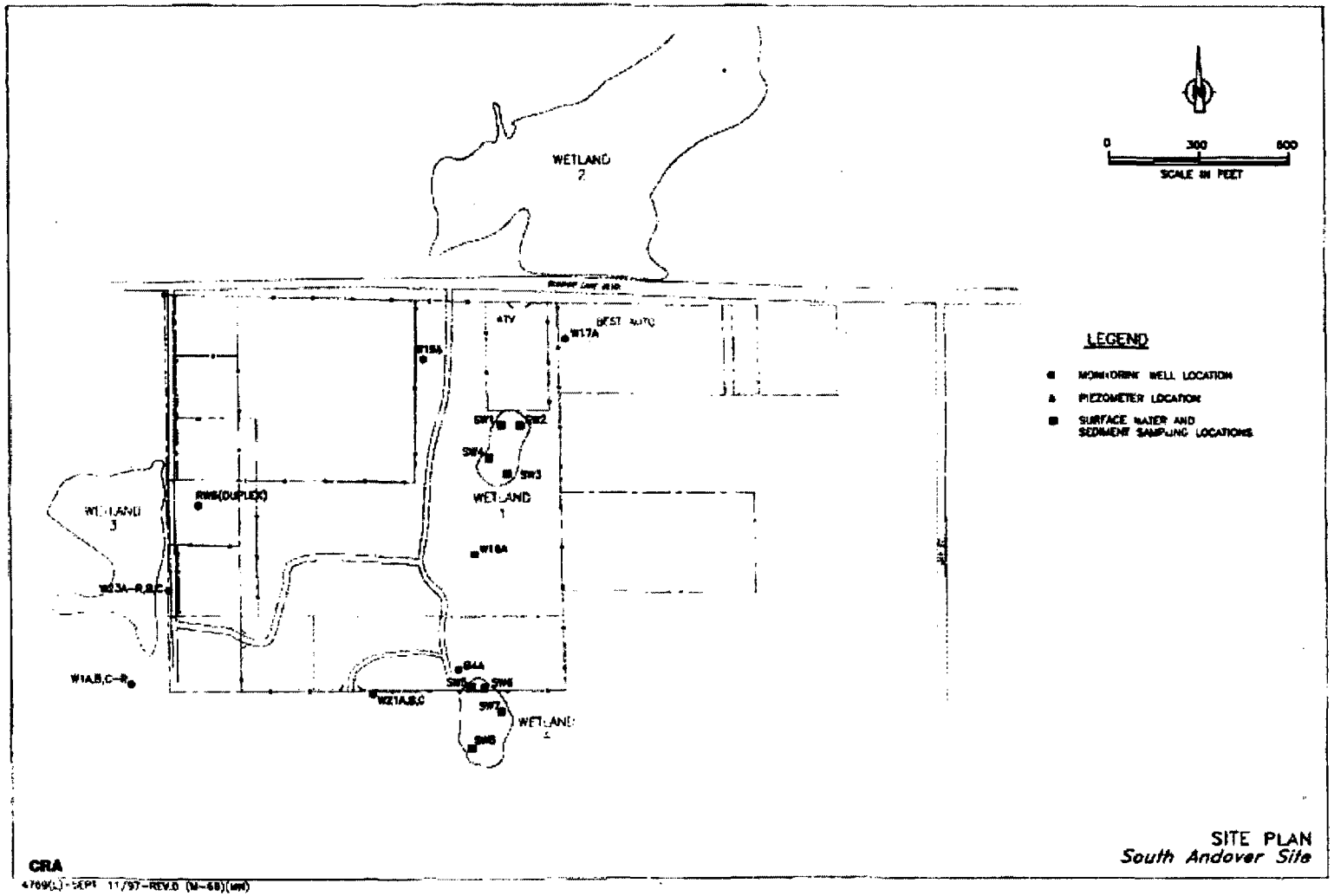

Figure 2. Locations of monitoring wells.
(from letter report "Natural Attenuation Study", Conestoga-Rovers & Associates, September 17, 1997)